Definition 0.1. In order to define the concept of *functor category*, let us consider for any two categories $\mathcal{A}$ and $\mathcal{A}'$, the class

$$\mathbf{M} = [\mathcal{A}, \mathcal{A}']$$

of all covariant functors from $\mathcal{A}$ to $\mathcal{A}'$. For any two such functors $F, K \in [\mathcal{A}, \mathcal{A}']$, $F : \mathcal{A} \to \mathcal{A}'$ and $K : \mathcal{A} \to \mathcal{A}'$, let us denote the class of all natural transformations from F to K by $[F, K]$. In the particular case when $[F, K]$ is a set one can still define for a small category $\mathcal{A}$, the set $Hom_{\mathbf{M}}(F, K)$. Thus, cf. p. 62 in [1], when $\mathcal{A}$ is a *small* category the 'class' $[F, K]$ of natural transformations from F to K may be viewed as a subclass of the cartesian product $\prod_{A \in \mathcal{A}}[F(A), K(A)]$, and because the latter is a *set* so is $[F, K]$ as well. Therefore, with the categorical law of composition of natural transformations of functors, and for $\mathcal{A}$ being small, $\mathbf{M} = [\mathcal{A}, \mathcal{A}']$ *satisfies the conditions for the definition of a category*, and it is in fact a *functor category*.

Remark: In the general case when $\mathcal{A}$ is *not small*, the proper class $\mathbf{M} = [\mathcal{A}, \mathcal{A}']$ may be endowed with the structure of a *supercategory* (defined as any formal interpretation of ETAS) with the usual categorical composition law for natural transformations of functors. Similarly, one can construct a *meta-category* defined as the *supercategory of all functor categories*.

References

[1] Mitchell, B.: 1965, *Theory of Categories*, Academic Press: London.

[2] Refs. [15], [17], [18] and [288] in the Bibliography of Category Theory and Algebraic Topology. Categories, Functors and Automata Theory: A Novel Approach to Quantum Automata through Algebraic-Topological Quantum Computations., *Proceed. 4th Intl. Congress LMPS*, P. Suppes, Editor (August-Sept. 1971).